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FURTHER NOTES ON THE SPORADIC APPEARANCE OF NON-EDIBLE MUSHROOMS IN CULTIVATED MUSHROOM BEDS

MICHAEL LEVINE

(WITH PLATE 4)

To the student of fleshy fungi the winter season can be used to great advantage in collecting and studying the Agarics and different forms of Pezizas which appear in cutlivated mushroom beds. In a previous paper[1] I pointed out that a number of agarics appear besides *Agaricus campestris* in cultivated mushroom beds and that in a number of cases rather uncommon mushrooms are found which appear to be confined to the mushroom house or appear but rarely outside of mushroom culture beds. At present the fungus *Panaeolus venenosus* Murrill;[2] interesting for its toxicological properties, is known only from mushroom beds in which the cultivated mushroom is grown. In the present note I wish further to add to the list of names of fungi which may be found in mushroom houses.

In the spring season of 1918, in New York, there commonly appeared in beds well illuminated, somewhat dry, and shortly after casing, a great number of small white mushrooms which at first glance gives one the impression of seeing large spots of white felt covering the soil. On closer examination it is found that the

[1] Levine, M. The sporadic appearance of non-edible mushrooms in culture of *Agaricus campestris*. Bull. Torr. Club. Feb., 1919.

[2] ——. The physiological properties of two species of poisonous mushrooms. Mem. Torr. Club 17: 176–201. *pls. 1–2.* 1918.

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white masses are due to great numbers of fused pilei which have relatively short stipes (see Figs. 1–4).

Further study shows that the plants are sometimes isolated, growing singly and centrally stiped as shown in figures 1 and 2, but these are not very common; more often the plants are laterally stiped and cespitose.

The individual plant varies in size from .25 cm. to 2 cm. in diameter and the height is about ⅕ to ¼ of the size of the diameter. The pileus is white and when fresh is covered by a very delicate and uneven tomentum. The pileus in the cespitose forms is umbonate but when it is centrally stiped, the disk is markedly depressed. The margin is incurved, thin, and irregular, and very often sinuous (Figure 3). When old the surface is smooth, white, and very faintly cream-colored. The stipe is white and short and has a tendency to taper upwards; very often it is lacking. The stipe generally remains white even when it is dry.

The gills are white when fresh but become decidedly cream-colored like the pileus when dry; slightly sinuate, adnate with a decurrent tooth; medium distant. When these plants are soaked in water shortly after drying they assume their natural color and consistency, which is more or less leathery. Their taste is pleasant and not unlike that of *Agaricus campestris.*

The spores are hyaline and ovoid in shape, measuring from 3.3 μ–4.4 μ × 6.6 μ–11 μ and form a spore print which is white. These plants were submitted to Dr. W. A. Murrill for identification, who regards them as a new species of no well determined genus. It is possible that these plants are dwarfed specimens of *Clitocybe dealbata,* but the great difference in size precludes their being regarded as typical of the species, although they may be closely related to it. It must be remembered that a number of varieties of this species have been reported. I am not prepared, however, to say that this is a new variety of *C. dealbata;* it certainly differs from all *C. dealbata* varieties so far described by Peck.[3]

Specimens of this fungus have been deposited with Dr. W. A. Murrill at the New York Botanical Garden.

[3] Peck, C. H. New York State Museum Bull. **157**: 67–68, 73, 1911.

ALEURIA VESICULOSA BULL. AND ALEURIA VESICULOSA BULL. VAR. SACCATA FR.

Other fungi, which appeared in the mushroom houses around New York about the same time, are shown in figures 5 to 10. These plants appeared in the manure of newly made mushroom beds. They were particularly abundant near the boards which enclosed the beds made under the benches in a greenhouse. The plants appeared in great clusters weighing from ½ to 2 lbs.

These plants are typical mushroom cellar plants and have been described and figured by Boudier.[4]

Aleuria vesiculosa var. *saccata* is identical with *Aleuria vesiculosa* except for the hymenial surface, which in the former is cerebriform as shown in figures 8 and 9. The spores also are slightly different in size. In the early stages no difference could be detected between them. The plants at this stage (Figures 5 and 6) are covered with a whitish-gray papillate structure which disappears as the plants grow older, although the color of the outer surface always remains lighter than the hymenium, which is buff-brown in color. Great numbers of plants in this stage appeared without showing any indication of a cerebriform hymenium, although at slightly older stages shown in figures 7 and 8 the two forms can readily be distinguished. It has been assumed that the manure and the soil used for casing are responsible for the sporadic appearance of the non-edible mushrooms in the mushroom cellars; up to the present however no conclusive evidence has been brought to bear on this subject and it may be suggested that the so-called "Pure Spawn" is not beyond suspicion.

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EXPLANATION OF PLATE 4

FIGS. 1, 2, 3, 4. Show the nature of the pileus, stipe, gills and general habit of fungus described in text. (Natural size.)

FIGS. 5, 6. Young stages in the development of *Aleuria vesiculosa* Bull. (Natural size.)

[4] Boudier, E. Icones Mycologicae 2: pl. 257–258. 4: p. 139.

FIG. 7. Older stage in the development of *Aleuria vesiculosa* Bull. (Natural size.)

FIG. 8. Slightly older stage in the development of *Aleuria vesiculosa* Bull. var. *saccata* Fr. (Size × ½.)

FIG. 9. Mature plant of *Aleuria vesiculosa* Bull. var. *saccata* Fr. (Size × ½.)

FIG. 10. A cluster of cups of *Aleuria vesiculosa*. (Size × ¼.)

AN UNDESCRIBED SPECIES OF OPHIODOTHELLA ON FICUS

ERNST A. BESSEY

(WITH PLATE 5)

The fungus herein described was collected repeatedly by the writer in the vicinity of Miami, Florida, in 1907 and 1908. It was recognized as an apparently undescribed Dothideaceous fungus, but until the appearance of the monograph on that group by Theissen and Sydow its generic position, even, could not be determined.

Ophiodothella Fici sp. nov.[1]

The stromata are 1 to 10 mm. in diameter, scattered irregularly or sometimes grouped concentrically, extending from the upper to the lower surface of the leaf, shining-black on the lower surface, usually long covered by the wrinkled remains of the epidermis and cuticle on the upper surface, which give it a whitish appearance. This coat disappears in old specimens and is often ruptured irregularly or pierced by the ostioles of the pycnidial cavities. The leaf is much thickened. Normally it is about 450 μ thick but the diseased spots may be 650 to 860 μ in thickness.

Three layers may be distinguished in the stroma: (1) between the upper epidermis and the palisade cells, usually destroying the inner two layers of the mostly three-layered epidermis, about 100 to 180 μ thick, light-colored and thinner near the edges and very dark and thicker toward the center, especially in proximity to the pycnidial cavities. The two-layered palisade parenchyma occupies about 100 to 120 μ, and is little modified except that the lower ends of the inner cells appear to be destroyed, and that here and there several cells of both rows are destroyed to make room for a mass of light-colored, stromatic hyphae to connect the

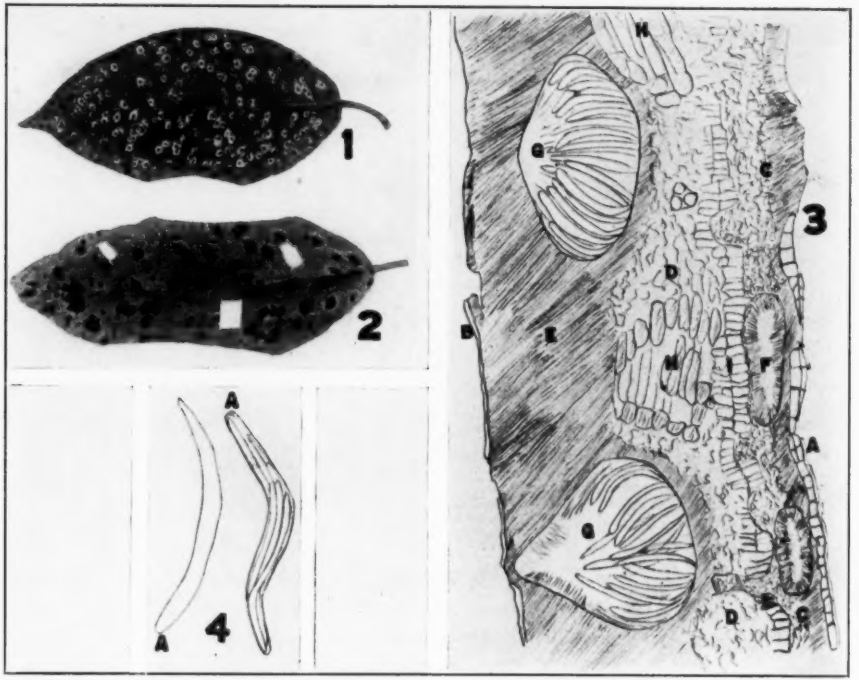
[1] Specimens of this species are in the collection of the New York Botanical Garden under the manuscript name of *Ophiodothis Fici* Earle. The species has also been collected in Cuba.

upper stromatic layer with the second one (2) which occupies most of the region normally filled by the spongy parenchyma. The latter is entirely destroyed or one may find a few disconnected cells here and there throughout the loose white stromatic structure which is 150 to 300 μ thick. This grades rather abruptly into (3) the lower stromatic mass which is dense and black and occupies the under side of the leaf to the utter destruction of the tissues, even the epidermis being destroyed except bits of the cuticle here and there, or near the edge of the spot. This layer is 210 to 230 μ thick.

The perithecia are few or many, depending upon the size of the stroma. They lie in the lower stroma, projecting upward into the loose, white middle stroma. In this latter the hyphae are darker and more densely crowded about the perithecial cavity. The perithecia are 400 to 450 μ high and 300 to 500 μ in diameter. The ostioles are only very slightly papillate. The basal portions of the perithecia appear on cross section of the leaf to be free, but in reality they are bound together by the loose mass of the colorless hyphae making up the middle stromatic layer. Their apical portions are connected by the lower stromatic layer almost as a sort of clypeus. There is no distinct perithecial wall. The very numerous asci arise in the basal portion of the perithecium and are elongate-fusiform, 105–175 $\times$ 12–16 μ, tapering gradually to the base and somewhat more abruptly to the rounded apex.

Between the asci are found occasional slender, filiform, septate (?) paraphyses which equal the asci in length. These are very numerous around the edge of the mass of asci and line the walls of the upper portion of the perithecial cavity. The eight ascospores are filiform, 77–87 $\times$ 4.7–6.2 μ, dilutely brown, very granular, the color residing in the granules, with a clear spot (vacuole ?) about 5 μ in length at the middle of the spore. They are not septate. Toward either end of the ascus they lie singly or doubly, but are in double or triple rows towards the middle. They taper more toward the lower end, being very slightly clavate. They are straight, or curved slightly at the smaller end.

In the younger spots before the perithecia appear, but persisting even until the maturity of the latter, there appear in the upper



OPHIODOTHELLA FICI BESSEY

stromatic layer a few to several pycnidial cavities which are at first without ostioles. They are 180 to 300 μ in diameter and about 75–100 μ thick in a vertical direction. They are lined on all sides by the very short conidiophores. The conidia are elongate, usually curved, rarely hooked, and slightly clavate, 12–19 $\times$ 1 μ, non-septate, and hyaline or very dilutely brown when examined singly. When the infected leaves are placed in a damp-chamber the conidia ooze out in a worm-like mass, very dark brown or even shining-black in color, to the naked eye, and fusco-ferruginous under the lower magnifications of the microscope.

The single stromata or groups of stromata occupy yellowish-green spots on the leaves, with ferruginous margins. When abundantly infected the whole leaf takes on a yellowish color, contrasting strongly with the black stromata. Such leaves fall prematurely in great numbers.

On the leaves of *Ficus aurea* near Larkins, Dade Co., Florida, Oct. 31, 1907 (type), and January 15, 1908, and at Little River, November 12, 1907, as well as occasionally at other places in the vicinity of Miami, Florida. Type deposited in the Mycological Herbarium of the Bureau of Plant Industry, U. S. Department of Agriculture.

This fungus belongs without doubt in the vicinity of the genus Ophiodothella as limited by Theissen and Sydow, but has paraphyses in the perithecia, while these authors describe the genus as aparaphysate. Furthermore, none of the hitherto recognized species of this genus possess a pycnidial stage such as has the present species. However, these points do not seem to warrant the erection of a new genus.

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EXPLANATION OF PLATE 5

FIG. 1. Leaf of *Ficus aurea* affected by *Ophiodothella Fici*, upper surface.

FIG. 2. Ditto, lower surface.

FIG. 3. Section of stroma: (*A*) remains of upper epidermis, (*B*) remains of lower cuticle, (*C*) upper stromatic layer, (*D*) middle stromatic layer, (*E*) lower stromatic layer, (*F*) pycnidium, (*G*) perithecium, (*H*) vascular bundle, (*I*) palisade layer. The outlines of this sketch were made with the aid of a camera lucida.

FIG. 4. Asci, one showing ascospores in outline; (*A*) apical end.

CONCERNING THE INTRODUCTION INTO THE UNITED STATES OF EXTRA-LIMITAL WOOD-DESTROYING FUNGI

JAMES R. WEIR

INTRODUCTION

A recent study of a number of tropical wood-destroying fungi which grow on species of trees, the wood of which, either in a manufactured or unmanufactured state, is imported into the United States, raises a question which may well receive attention from foresters and dealers in structural timbers. Our plant quarantine laws provide for a close scrutiny of a great variety of plant material, but no one has given much thought to the possibility of the introduction into this country of wood-destroying fungi on imported timbers.

That fungi may be transmitted to distant parts of the country by the living mycelium in the wood of structural timber in initial stages of decay, is well known. A few examples in the writer's experience are illuminating. At Portland, Oregon, on a white oak timber which had come originally from Ohio, the sporophores of *Stereum frustulosum* Fr. were found. This fungus has never been reported from the West, and in this case was certainly carried in the diseased timber. It could be easily introduced into western hardwood forests by this means. At Bellingham, Washington, in August, 1916, two species of wood-destroying fungi not native to this country were collected from old timbers stacked on the harbor wharves. The timbers were practically rotted and evidently had been used in temporary structure work in vessels. These two species, viz., *Polystictus Persoonii* Fr. and *Trametes atypus* Lév. (*T. aurora* Ces., *T. palcacea*), are common in all tropical and semi-tropical countries, especially in Japan and the Philippines. Several collections of the latter species from the Philippines, in the writer's herbarium, show that it grows on some

of the most valuable timber trees of that region, and evidently causes a serious rot. It has also been observed that in one case square timbers showed incipient or initial decay by fungi not known to occur in the foreign country to which the timbers were shipped. The ease with which lumber may become infected, while stored in insanitary yards, is only another example of how wood-destroying fungi may be transported from one country to another.

DISTRIBUTION OF WOOD-DESTROYING FUNGI

In contrast to the higher plants, many of the wood-destroying fungi are widely distributed throughout the world. For example, *Fomes annosus* Fr., *Fomes* (*Trametes*) *Pini* (Brot.) Lloyd, and *Armillaria mellea* (Vahl.), three of the most destructive forest tree fungi in America and Europe, are reported from various tropical countries. In the latter regions these species are apparently not abundant, a condition which is difficult to explain. On the other hand, there are a number of serious wood-destroyers and parasitic species which are confined to the tropics or to foreign countries in general. There is no reason why these species should not find a favorable environment in some of the varied climates of the United States, if once introduced. It is well known that in the case of some parasitic fungi a change from one country to another of different climatic conditions may often be favorable to the fungus, which may develop into a serious pest. This could be true of many foreign wood-destroying fungi.

POSSIBLE EXPLANATIONS FOR THE APPARENT SMALL NUMBER OF WOOD-DESTROYING FUNGI IN THE TROPICS

Contrary to the general opinion and as compared to the conditions in the temperate zones, the number of species of this group in the tropics may not be considered particularly abundant. Westerdijk[1] explains this condition through the assumption that in the tropics "the heavy rainfalls, combined with the abundant transpiration—owing to the intense heat, must cause a high water-

[1] Westerdijk, Johanna. Phytopathology in the Tropics. Ann. Mo. Bot. Gard. 2: 308. 1915.

content and a small air-content, of the wood-vessels of the trees, thereby making a substratum poor in air. . . ."

The assumption that an abundant transpiration may cause a high water content in the tissues is in direct contradiction to the latest research on the subject. Dixon[2] demonstrated that the transpiration pull during the growing season tends to reduce the water content of the plant, hence the gas content is increased. That the gas content in the wood is an important factor influencing the entrance of the mycelium and its subsequent spread has been experimentally determined by Münch.[3] More recently Zeller[4] showed that any factor influencing the proportion of water and air in the substratum is of great importance.

A factor which would apparently retard the development of wood-destroying fungi in the wood-vessels of trees growing in the tropics is the absence of any marked periodicity in wood formation. Naturally the vital processes in tropical vegetation have a rhythmical alternation of periods of rest and activity, determined usually by a wet and dry season, but the latter period is short and no such contrast between large and small vessels is produced as in temperate zones. This condition of almost continuous growth in contrast to the alternating periods of rest and growth in colder climates may tend to retard the spread of mycelium in the wood. This is reasonable to suppose, in view of the fact that in the temperate zone wood-destroying fungi are more active during the dormant period of their hosts. Continuous growth, or unimportant temperate changes, may either one conceivably result in decreased air content, and the mycelium would have difficulty in finding the proper balance between air and moisture in the wood. The great density of most tropical woods would also be a factor in this respect. Again, it is conceivable that the soil solutions in the tropics, being warmer and therefore less able to hold gas in solution, contain less oxygen than in tem-

[2] Dixon, H. H. Transpiration and the ascent of sap in plants. Macmillan & Co. 1914.

[3] Münch, E. Untersuchungen über Immunität und Krankheitsempfänglichkeit der Holspflanzen. Naturwiss. Zeitschr. f. Forst. u. Landw. **7**: 54–75, 87–114, 129–160. 1909.

[4] Zeller, S. M. Studies in the physiology of the fungi. II. *Lenzites saepiaria* Fr., with special reference to enzyme activity. Ann. of Mo. Bot. Gard. **3**: 448–449. 1916.

perate regions. This high temperature and consequent low gas solubility, resulting in a deficiency of dissolved oxygen in soil solutions and therefore in cell sap, might make tropical wood less aërated. Abundant decaying organic matter resulting in a soil solution with a low oxygen and a high carbon dioxide content might possibly produce a cell sap with the same unfavorable gas content. There is also a possibility of the heartwood of trees remaining functional for a longer period than is the case in temperate zones. This would reduce the gas content and prevent the advance of the mycelium in the wood. This condition is analogous to the observed behavior of mycelia of wood-destroying fungi in the wood of resinous and non-resinous conifers, or in the wood of broad-leaved species forming or not forming heartwood. In trees with a pronounced heartwood, decay is usually very pronounced, in contrast to those where the central cylinder remains for a longer time functional; that is, transporting soil solutions to the crown. There are exceptions to this generalization. The heartwood of birch, which remains functional for a longer time than that of oak, is seriously rotted by *Fomes ignarius* (Gill). The non-resinous heartwood of *Abies grandis* is uniformly rotted by *Echinodontium tinctorium* E. and E. Undoubtedly the requirements of fungi differ to the extent that whereas one species may find the non-resinous heartwood of *Abies*, for example, favorable, as in the case of *Echinodontium*, the fungus will not develop in the wood of pine or larch. In the case of *Abies* and *Echinodontium* we may assume that the gas present in the heartwood of the host may be of a higher oxygen ratio than is the case in those trees which it will not attack. To understand the particular conditions which govern the relations of host and fungus is a problem for the future, and is of great practical importance.

TROPICAL WOOD-DESTROYING FUNGI IN THE TEMPERATE ZONE

The reason for contrasting the conditions of growth between the tropics and temperate zones is by way of introduction to the idea that the wound fungi[5] of tropical or foreign timber trees

[5] In the writer's opinion the term "wound parasite" as it is ordinarily employed is misleading. The parasitism of but few wood-destroying fungi

would find favorable conditions for growth on our native species. It is to be assumed, of course, that our native forest trees, at least in some regions, would be susceptible to attack. It may also be assumed that the tropical fungi have built up strong parasitic tendencies in order to counteract continuous growth in their exogenous and endogenous growing hosts, which would tend to make them more vigorous and destructive when growing under reverse conditions. Of course, all of this is pure conjecture, for our knowledge as to how fungi endemic in tropical and foreign countries would react to the low temperature of a more temperate climate, is very limited. Unless their food requirements are at variance with that which they would find in our native trees, the lower temperature can be expected to stimulate growth. The average temperature for the growth of wood-destroying fungi is comparatively low. Falck[6] has shown that the growth range for a number of wood-destroying fungi lies between 3° and 44° C., with an optimum temperature between 18° and 35° C. Humphrey[7] states that "for the majority of species the most favorable temperature lies between 75° and 85° F." This author further states that out of a series of some 50 species tested none would grow above 118° F., and in general wood-destroying fungi are much less tolerant of high temperatures than low ones, while temperatures slightly above the freezing point will usually permit some growth. This writer found that on storing a large number of stock cultures of different species in an ice box where the

has been investigated. The mere fact that they are found growing from wounds does not imply that they would attack the living cell. *Fomes pinicola*, one of the most common saprophytes, chiefly on coniferous wood, not infrequently enters through wounds and destroys the heartwood of living trees, but it would not be considered parasitic. Some such term as *wound fungus* would be more conservative, and would merely imply that the fungus grew on the dead wood of wounds or entered the heartwood in this manner.

[6] Falck, Richard. Wachstumgesetze, Wachstumfaktoren und Temperaturwerte der hölzzerstörenden Mycelien. In Moller, Alfred. Hausschwammforschungen. Heft 1, p. 53–154. 1907.

——. Die Lenzitesfäule des Coniferenholzes, eine auf kultureller Grundlage bearbeitete Monographie der Coniferenholz bewohnenden Lenzites-Arten. In Möller, Alfred. Hausschwammforschungen. Heft 3, 234 pp. 24 fig., 7 pl. 1909.

[7] Humphrey. Timber decay and its growing importance. Railway Age Gazette, p. 10. Dec. 15, 1916.

temperatures vary around 40° to 60° F., several species grew luxuriantly. It is known that the coldest weather in northern climates is not sufficient to destroy the vitality of sporophores of tree fungi, in fact Buller[8] has shown that certain species will withstand the temperature of liquid air (— 190 deg.) for protracted periods. Westerdijk[9] advances the view that the tropical temperature is too high for many fungi, and states that in her laboratory over 600 fungi are cultivated, and this collection shows cleary that the temperature of optimum growth of the greater part of the fungi lies below 30° C., often under 25° C. An exposure to high temperature prevents many parasites from forming their spores or fruiting bodies, whereas others require a change of temperature for normal growth. The Polyporaceae, for instance, bear exposure to frost very well, but many of them scarcely develop at 30° C. That the low winter temperatures of northern climates will not affect the vitality of at least some tropical wood-destroying fungi is shown by the following experiment. During the winter of 1909, the writer took a section of a tree branch on which were two or three small sporophores of *Polystictus sanguineus* Fr. from the mycological collection at the University of Munich, and placed it on the ground in the forest among other branches of native Alnus bearing sporophores of *Polystictus hirsutus* Fr. The branch had been in the collection about two years and had been collected in the low lands of Brazil. Very early in the following spring, while snow was still on the ground, the sporophores of the native fungus started growing. A week later the tripical species revived, and before the end of spring not only had produced a new hymenium but enlarged its hymenial surface to about one fourth of its original size, and one entirely new but small sporophore was produced. Sporophores of *Polystictus occidentalis* (Klotzsch) and *P. maxima* (Mont.) from the warm zones of Cuba attached to their substrata were exposed to

[8] Buller. Upon the vitality by dried fruiting bodies of certain Hymenomycetes, including an account of an experiment with liquid air. Trans. of the British Mycological Society, 112. 1912.

Also Buller and Cameron. On the temporary suspension of vitality in the fruit bodies of certain Hymenomycetes. Trans. of the Royal Soc. of Canada. Third Ser. 6: 73–75. 1912.

[9] Westerdijk, Johanna. Loc. cit. 1.

the winter weather of Missoula, Mont. (—30° Fahr.). In late spring these plants revived and produced new fertile spore surfaces. These experiments not only illustrate the xerophytic nature of the group[10] to which they belong, but demonstrate the fact that at least some tropical wood-destroying fungi will, no doubt, find suitable conditions of growth in regions farther north. It may be expected, of course, that the change in environment will affect certain morphological changes in the fruiting structure. Indeed the question may be asked, why not regard *Polystictus sanguineus* identical with *P. cinnabarinus* Jacq. This response to change in environment may be observed in any of our native species in its range from warmer and drier regions to the damp cold forests of the north, or when observed at different elevations on high mountains.[11]

As already indicated, there is always the danger of a fungus, irrespective of the part of the world from which it may come, finding a more favorable environment when introduced into new regions. The history of many of our plant disease epidemics in this country during the past few years illustrates this fully. It is possible that certain of our common wound fungi may have developed parasitic tendencies due to great difficulties to be overcome, as has previously been indicated, and may be of some economic importance in this country. For example, *Fomes applanatus* Pers., found in the heartwood of a variety of trees, is not known to be a parasite in this country. The writer has specimens of this fungus from Peru, with the statement that it attacks the roots of fruit trees and does considerable damage. This would lead one to think that it would be unsafe to introduce this particular strain (if it may be so called) or this species into this country.

Not until investigations in forest pathology in tropical lands have reached as high a plane as they have in temperate zones will we know what we may fall heir to from foreign countries. With the increase in commercial intercourse with foreign lands and the increased demands for the timbers and other plant life they pro-

[10] Buller. Loc. cit. 8.

[11] Weir, Jas. R. Notes on the altitudinal range of forest fungi. MYCOLOGIA, 10: p. 4–14. 1918.

duce, it is reasonable to suppose that we may expect wood-destroying fungi to find their way into this country. It would seem a wise plan to make a careful study of the agents of decay directly in the field where they grow. This would yield a knowledge of the fungous diseases in the uncultivated forests of exporting countries, and our inspectors could then do their work more intelligently.

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INDEX TO AMERICAN SPECIES OF PHYLLOSTICTA

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In "The North American Phyllostictas" Ellis and Everhart brought together descriptions of all the species of this genus reported from North America up to 1900. About 225 species were included. During the eighteen years which have elapsed since the publication of that excellent monograph 41 new species have been described from America north of Mexico, 20 other described species have been reported for the first time, 116 new hosts have been added, transfers have been made to and from the genus, *Ascomycete* connections have been established for a few and various changes in names of species and hosts have been proposed. There is no one place in the literature where these changes have been recorded and the genus brought up to date. Saccardo lists only a few of the new species. Having found a *Phyllosticta* on a host new to himself, the collector at once turns to Ellis and Everhart. If he fails to find it there, he is confronted with the prospect of spending many hours, or even days, searching through a staggering array of periodicals to see whether it has been described. Even if he finds it in "The North American Phillostictas" he wonders how many changes it has undergone since 1900. His difficulties are not diminished by the changes in names of the host plants since Ellis and Everhart wrote.

Having had this discouraging experience a few times in working with *Phyllosticta,* the writer finally resorted to a card index in which he has listed the new species, hosts and various changes with citations, and which he uses as a supplement to the previously mentioned monograph. It is published here with the thought that others also may find it useful in saving many tedious hours spent in combing the numberless periodicals, etc., in which a description or report of an American species may be hidden away.

The species are first listed alphabetically with citations of litera-

ture and occasional explanatory notes. For convenience in reference they are numbered serially beginning with 228, the next number after the last in "The North American Phyllostictas." Species which have been described as new from American plants since 1900 are indicated by bold face type in the citation. The compartively few species reported from tropical America, viz., Central America, Mexico and the West Indies, are not included.

The host index which follows includes all species on which Phyllostictas have been reported, both those in Ellis and Everhart's monograph and those subsequently reported. The names of all hosts have been made to conform with the Seventh Edition of Gray's Manual of Botany except for those which occur beyond the field of the Manual.

Doubtless, a closer scrutiny of the species and comparative examination of type material will show that some of the species in this list are synonyms. But the present paper is not presented as a critical review of the genus. It is merely a ready finding index by which the collector may quickly find the literature on the *Phyllostictae* which occur on a host and then draw his own conclusions. The numbers used in the host index refer to the numbered species in "The North American Phyllostictas" and to the numbers used in the alphabetical supplementary list here given.

ALPHABETICAL LIST OF SPECIES[1]

[1] In order to conserve space the following abbreviations are used: M. = Mycologia; J. M. = Journal of Mycology; A. M. = Annales Mycologici; B. = Bulletin; R. = Report; N. Y. Mus. B. = Bulletin of the New York State Museum; N. A. Ph. = The North American Phyllostictas; B. Tor. B. C. = Bulletin of the Torrey Botanical Club. Other periodicals are abbreviated in the usual way so that there will probably be no difficulty in understanding them.

228 *Alcides* Sacc. var. *americana* Sacc. & D. Sacc., on *Populus alba* Syl. 18: 240. = *P. Alcides* E. & K. O. Nat. **2**: 223. 1902.

229 *Ampelopsidis* E. & M. (N. A. Ph. 71) = *Guignardia Bidwelli* (Ell.) Viala & Ravaz. See N. Y. (Cornell) B. 293: 307 for synonymy.

230 *Antirrhini* Syd., on *Antirrhinum majus* in Mass. This species has not previously been reported from America unless it is identical with the Phoma reported by Stewart on this host. N. Y. (Geneva) B. 179: 109. 1900.

231 *apicalis* Davis, on *Salix lucida* in Wis. **Wis. Ac. Sci. 16 (II): 761.** 1909.

232 *Apocyni* Trel. (N. A. Ph. 132), on *Apocynum androsaemifolia* in N. Y. N. Y. Mus. B. 188: 49. 1916. New host.

233 *arida* Earle, on *Acer Negundo* in Ala. **B. Tor. B. C. 25: 367.** 1898.

234 *Atriplicis* Desm., on *Atriplex hastata* in Pa. M. **6**: 33. 1914. Author believes this is either a Macrophoma or a Septoria. Reported on *Chenopodium album*. M. **8**: 176. 1916. Also on *C. album* in Wis. Ac. Sci. **17** (II): 865. 1914.

235 *Baccharidis* Dearn. & House, on *Baccharis halimifolia* in N. Y. **N. Y. Mus. B. 179: 29.** 1915.

236 *Betae* Oudem., on *Beta vulgaris*. = *Phoma Betae*. J. M. **10**: 2. 1904. = *P. tabifica*. Impf. of *Mycosphaerella tabifica* (P. & D.) Johns.? (Cf. Stevens' Fungi which cause plant diseases, p. 247.)

237 *bicolor* Pk., on *Rubus odoratus* in N. Y. **N. Y. Mus. R. 43: 72.** 1890.

238 *biformis* Heald & Wolf, on *Diospyros texana* in Texas. **M. 3: 7.** 1911.

239 *brassicicola* McA., on *Brassica oleracea* in Calif. Impf. of *Mycosphaerella brassicicola* (Duby) Lin. Phytopath. **5**: 263. 1915.

240 *brumeliifolia* Heald & Wolf, on *Brumellia lanuginosa* in Tex. **M. 3: 7.** 1911.

241 *brunnea* Dearn. & Barth., on *Populus angustifolia* in Col. **M. 9: 351.** 1917.

242 *canescens* E. & E. (N. A. Ph. 67), on *Ribes divaricatum* in Idaho. B. Tor. Bot. Cl. **27**: 54. 1900.

243 *caricicola* Sacc. & Scalia, on *Carex sp.* in Alaska. **Alas. Har. Exp. 5: 21.** 1904.

244 *Caricis* (Fckl.) Sacc. (N. A. Ph. 218), on *Carex trisperma* and *C. intumescens* in Wis. Wis. Ac. Sci. **17** (II): 865. 1914.

245 *Cephalanthi* Tharp, on *Cephalanthus occidentalis* in Tex. **M. 9: 119.** 1917.

246 *Chenopodii* Sacc., on *Chenopodium album* in N. Y. N. Y. Mus. B. 179: 29. 1915.

247 *circumscissa* Cke. (N. A. Ph. 44), on *Prunus persica* in N. Y. Tor. **14**: 210. 1914. The host is not given in N. A. Ph. but the reference is to exsiccati on *Prunus demissa*.

248 *clypeata* E. & E., on *Pyrus Malus* in Ore. **J. M. 8: 14.** 1902.

249 *Collinsoniae* Sacc. & Dearn., on *Collinsonia canadensis* in Ont. **A. M. 12: 299.** 1914.

250 *congesta* Heald & Wolf on *Prunus* in Tex. **M. 3: 8.** 1911.

251 *convexula* Bubak on *Carya alba* in Mo. **J. M. 12: 62.** 1906.

252 *Crataegi* (Cke.) Sacc. (N. A. Ph. 82), on *Crataegus erythropoda* in N. M. M. **10**: 253. 1918. On *C. Holmesiana* in N. Y. N. Y. Mus. B. 197: 49. 1918. New hosts.

253 *crataegicola* Sacc., on *Crataegus mollis* in N. D. M. **10**: 218. 1918.

254 *cruenta* (Fr.) Kicks. (N. A. Ph. 215), on *Smilicina stellata* in N. D. M. **10**: 218. 1918. On *S. amplexicaulis* in N. M. M. **8**: 176. 1916. New hosts and change in authority for binomial.

255 *cruenta* var. *discincta* Davis on *Uvularia grandiflora* and *Oakesia sessilifolia* in Wis. **Wis. Ac. Sci. 16 (II): 761.** 1909. Also **17 (II): 867.** 1914.

256 *cucurbitacearum* Sacc., on *Cucumis sativa* and *C. melo* in Ohio. O. B. 214: 394. Reported from various other states.

257 *Dearnessii* Sacc., on *Rubus triflorus* in Ont. **A. M. 11: 549.** 1913.

258 *decidua* E. & K. (N. A. Ph. 201), on *Radicula Armoracia, Geum canadense, Aralia racemosa, Steironema ciliatum, Cynoglossum officinale, Lappula virginiana, Scutellaria laterifolia, Nepeta hederacea, Stachys palustris, S. tenuifolia, Monarda punctata, Lycopus uniflorus, Mentha arvensis canadensis, Eupatorium perfoliatum, Bidens frondosa, Lactuca canadensis* and *Hieracium aurantiacum* in Wis. Wis. Ac. Sci. 17 (II): 867. 1914 and **18 (I): 258.** 1915. New hosts. Vernonia, listed in N. A. Ph., is evidently a mistake for Veronica.

259 *destruens* Desm. (N. A. Ph. 40), on *Prunus melanocarpa* in N. D. M. 10: 218. 1918. Identical with *Phoma virginiana* E. & Hals. acc. to Davis. Wis. Ac. Sci. 18 (I): 79. 1915. New host.

260 *Dictamni* Fairm., on *Dictamnus Fraxinella* in N. Y. **A. M. 8: 324.** 1910.

261 *Diervillae* Davis, on *Diervilla Lonicera* in Wis. **Wis. Ac. Sci. 16 (II): 761.** 1909.

262 *Digitalis* Bell, on Digitalis in N. Y. Tor. 14: 210. 1914. On *D. purpurea* in Ont. A. M. 11: 549. 1913.

263 *Euonymi* Tharp, on *Euonymus atropurpureus* in Tex. **M. 9: 119.** 1917.

264 *fragaricola* Desm. & Rob., on *Fragaria grandiflora* in Ont. A. M. 11: 549. 1913.

265 *fraxinicola* (Curr.) Sacc. emended. J. M. 13: 51. 1907.

266 *Garrettii* Syd., on *Senecio disparis* in Utah. **A. M. 6: 484.** 1908.

267 *grisea* Pk., on *Crataegus praecox* in N. Y. **N. Y. Mus. B. 67: 29.** 1903.

268 *helliboricola* var. *Coptidis* Sacc. & Scalia, on *Coptis trifoliata* in Alaska. **Alas. Har. Exp. 5: 21.** 1904.

269 *hortorum* Speg. (N. A. Ph. 167), on *Solanum melongenum* (cult.) in Wis. Wis. Ac. Sci. 17 (II): 867. 1914. New host.

270 *innumerabilis* Pk., on Amelanchier in Nebr. **B. Tor. Cl. 36:** 336. 1909.

271 *ivaecola* E. & E. (N. A. Ph. 12), on *Iva xanthiifolia* in N. D. M. 10: 218. 1918. New host.

272 *juliflora* E. & B., on pods of *Prosopis juliflora* in Tex. **J. M. 8: 174.** 1902.

273 *kalmicola* Schw. var. *berolinensiformis* Fairm., on *Kalmia latifolia* in N. Y. **A. M. 8: 324.** 1910.

274 *labruscae* Thuem. (N. A. Ph. 71), on *Vitis vulpina* in Iowa. M. 1: 269. On *Psedera quinquefolia* in N. D. M. 10: 218. 1918. Various other states. On *Ps. tricuspidata* in N. Y. Tor. 14: 210. 1914. On *P. vitacea* in Wis. Wis. Ac. Sci. 17 (II): 866. 1914. New hosts. Imperf. of *Guignardia Bidwellii* (Ell.) Viala & Ravaz. For full synonymy see N. Y. (Cor.) B. 293: 307.

275 *lantanoidis* Pk. (N. A. Ph. 94), on *Viburnum cassinoides* in N. Y. N. Y. Mus. B. 179: 29. 1915. New host.

276 *Liatridis* Davis, on *Liatris spicata* in Wis. **Wis. Ac. Sci. 18 (I): 87.** 1915.

277 *Liriodendri* Cke., emended. J. M. **13**: 51. 1907.

278 *livida* E. & E. (N. A. Ph. 49), on *Quercus macrocarpa* in Wis. Wis. Ac. Sci. **18** (I): 87. 1915. New host.

279 *macroguttata* Earle, on *Desmodium Dillenii* and *D. sp.* in Ala. **B. Tor. B. C. 25: 367.** 1898.

280 *maculicola* Hals., on Dracaena in N. J. **N. J. R. 14: 355.** 1893.

281 *maculiformis* Sacc., on *Alnus rugosa* in N. Y. N. Y. Mus. B. 197: 49. Impf. of *Mycosphaerella maculiformis* (Pers.) Schr.

282 *mahoniaecola* Pass., on Mahonia in N. Y. N. Y. Mus. B. 167: 30. 1912.

283 *Medeolae* Dearn. & House, on *Medeola virginiana* in N. Y. **N. Y. Mus. B. 179: 29.** 1915.

284 *minima* (B. & C.) E. & E. (N. A. Ph. 1), on *Acer saccharum, A. saccharinum* and *A. spicatum*. Wis. Ac. Sci. **17** (II): 866 and **18** (I): 258. 1914 and 1915. New hosts.

285 *Mulgedii* Davis, on *Lactuca leucophaea* in Wis. **Wis. Ac. Sci. 16 (II): 761.** 1909. Davis later decided that this was probably a Phoma. Wis. Ac. **18** (I): 79. 1915.

286 *Myricae* Cke. (N. A. Ph. 72), on *Myrica carolinensis* in N. Y. N. Y. Mus. B. 188: 38. 1916. New host.

287 *nebulosa* Sacc., on *Silene noctiflora* in Wis. Wis. Ac. Sc. **17** (II): 865. 1914.

288 *Oakesiae* Dearn. & House, on *Uvularia* (*Oakesia*) *sessilifolia* in N. Y. **N. Y. Mus. B. 179: 30.** 1915.

289 *obscurans* (E. & E.) Fl. Tassi. Bul. Lab. ed. Orto Bot. Siena **5**: 13. 1902. First described by Ellis & Everhart as *Phoma obscurans* on Fragaria (cult.) in Va. Proc. Phil. Acad. **1894**: 357.

290 *orobella* Sacc., on *Lathyrus maritimus* in N. Y. N. Y. Mus. B. 179: 30. 1915.

291 *Oxalidis* Sacc., on *Oxalis stricta* in Wis. Wis. Ac. Sci. **17** (II): 866. 1914.

292 *Pachysandrae* Dearn. & House, on *Pachysandra procumbens* in N. C. **N. Y. Mus. B. 179: 35.** 1915.

293 *Padi* Brun, on *Prunus virginiana* in Canada. A. M. **11**: 549. 1913.

294 *pallidior* Pk., on *Smilacina stellata* in N. Y. **N. Y. Mus. B. 105: 26.** 1905. = *P. cruenta* (Fr.) Kicks. var. *pallidior* (Pk.) Davis on *S. racemosa* and *S. stellata* in Wis. Wis. Ac. Sc. **17** (II): 865. 1914.

295 *paupercula* Pk., on *Amelanchier alnifolia* in Kans. **N. Y. Mus. B. 150: 60.** 1911.

296 *Paviae* Desm. (N. A. Ph. 122), = *Guignardia Aesculi* (Pk.) Stewart. Phytopath. **6**: 5. 1916. *P. aesculicola* Sacc. (N. A. Ph. 123) regarded by Stewart as the spermagonial stage of the same species.

297 *phomiformis* Sacc. (N. A. Ph. 56) on *Quercus Prinus* and *Q. prinoides* in N. Y. N. Y. Mus. B. 188: 50. On *Q. bicolor* in Wis. Wis. Ac. Sci. **18** (I): 258. 1915. New hosts.

298 *pirina* Sacc. = *Coniothyrium pirina* (Sacc.) Sheldon. Torreya, July, 1907. See also Sci. (II) **36**: 155–157. 1912.

299 *Pitcheriana* Fairm., on *Heliopsis Pitcheriana* (cult.) in N. Y. A. M. 8: 324. 1910.

300 *prunicola* Sacc. (N. A. Ph. 45), on *Prunus nigra* in Wis. Wis. Ac. Sc. **17** (II): 866. 1914. New host.

301 *Psoraleae* (Cke.) Fl. Tassi, on Psoralea. Described as *Phoma Psoralea* Cke. Bul. Lab. ed Orto Bot. Siena **5**: 13. 1902.

302 *putrifaciens* Shear, on *Vaccinium macrocarpum* in N. J. **B. Tor. B. Cl. 34: 307.** 1907.

303 *Quercus* Sacc. & Speg., on *Quercus alba* and *Q. macrocarpa* in Wis. Wis. Ac. Sc. **17** (II): 865. 1914.

304 *raui* (Pk.) Dearn. & House, on *Artemisia scopulorum* in Col. N. Y. Mus. B. 179: 36. 1915. Synonymy given. Previously called Sphaeropsis by Peck.

305 *renouana* Sacc. and Roum., on *Typha latifolia* in Wis. Wis. Ac. Sc. **17** (II): 864. 1914.

306 *Rhexiae* Dearn. & House, on *Rhexia ciliosa* in Fla. **N. Y. Mus. B. 179: 35.** 1915.

307 *Richardsoniae* E. & E., on *Richardsonia scabra* in Ala. **J. M. 8: 62.** 1902.

308 *Sassafras* Cke., emended, J. M. **13**: 53. 1907.

309 *sicyna* Sacc., on *Sicyos angulatus* in N. Y. **A. M. 10: 343.** 1908.

310 *smilicina* (Pk.) Dearn., should replace *P. Smilacis* E. & M. (N. A. Ph. 221) M. **9**: 351. 1917. Full synonymy given. On *Smilax rotundifolia* in N. Y. Torreya **14**: 210. 1914.

311 *solitaria* E. & E. (N. A. Ph. 104), on *Pyrus Malus* throughout the central states. Sci. (II) **26**: 183. 1907. New host. The specific name given in N. A. Ph. is evidently incorrectly spelled.

312 *Steironematis* Dearn. & House, on *Steironema ciliatum* in N. Y. **N. Y. Mus. B. 188: 38.** 1916.

313 *subtilis* Pk., on *Carya* in N. Y. **N. Y. Mus. B. 150: 36.** 1911.

314 *Syriaca* Sacc., on *Hibiscus syriacus* in N. Y. J. M. **13**: 69. 1907.

315 *Syringae* West, on *Syringa vulgaris* in Wis. Wis. Ac. Sc. **17** (II): 867. 1914.

316 *tabifica* Prill. See *P. Betae.*

317 *tineola* Sacc. on *Viburnum pubescens* in Wis. Wis. Ac. Sc. **17** (II): 867. 1914.

318 *Trillii* E. & E. (N. A. Ph. 146), on *Trillium cernum* in Wis. Wis. Ac. Sc. **17** (II): 865. 1914. New host.

319 *typhina* Sacc. on Typha in N. Y. J. M. **13**: 69. 1907.

320 *verbenicola* Tharp, on *Verbena bipinnatifida* in Tex. **M. 9: 120.** 1917. This specific name is untenable because previously used, cf. *P. verbenicola* Martin, J. M. **2**: 26. 1886.

321 *Verbesinae* Heald & Wolf, on *Verbesina texana* in Tex. **M. 3: 8.** 1911.

322 *virginiana* (Ell. & Hals.) Fl. Tassi. The correct name for *Phoma virginiana* E. & H. Bul. Lab. ed Orto Bot. Siena **5**: 13. 1902.

323 *Medicaginis* Fckl. on alfalfa in the central states. Impf. of *Pyrenopeziza Medicaginis* Fckl. Phytopath. **6**: 102. 1916.

324 *straminella* Bres., on rhubarb, *Rheum Rhaponticum*, in Ind. and Ills. Ills. Exp. Sta. B. 213. 1919.

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AMHERST, MASSACHUSETTS,
January, 1919.

NEW JAPANESE FUNGI

NOTES AND TRANSLATIONS—VI

TYÔZABURÔ TANAKA

UNCINULA CURVISPORA K. Hara sp. nov. (in litt.).

Uncinula septata Salm. var. *curvispora* K. Hara var. nov. in Dainippon Sanrin Kwaihô (Journ. Forestry Asso. Japan) Tôkyô, **392**: 62. T. 4, vii Jul. 1915. (Japanese.)

Spots obsolete, hypophyllous; mycelia spreading in thin film-like overgrowth, fugacious; perithecia punctiform, scattered, flat-discoidal or conspicuously compressed into scale form, 170–220 μ (aver. 200 μ) diam., black; perithecial wall membranaceous, cells small and irregular, sometimes more or less radiating, 4–8 μ wide; appendages numerous, 200–300 altogether, filiform, simple, smooth, thin-walled, 35–200 μ long, 4–11 septate throughout, the basal half yellowish-brown, 6–7 μ across, gradually narrowed toward the apex, 2–2.5 μ across near the hyaline ends, apex coiled spirally; asci 3–5 to one perithecium, ellipsoid or ovoid, rounded at the apex, beaked, below, walls rather thick but brittle, 65–75 × 37–50 μ; ascospores 4–5, ellipsoid, ovoid, or ovoid-reniform, both ends rounded, yellowish, unicellular, granular inside, 28–35 × 12–15 rarely 45 × 18 μ.

On *Fagus sylvatica* var. *Sieboldi*.

Locality and distribution: Not given.

Notes: In a letter from Mr. Hara, received shortly before by the writer, a very peculiar habit of this fungus is described, which caused him to determine to raise this as a species. He found that the perithecia at maturity behaved always to turn over on their heads holding the substratum with their appendages exactly like the perithecia of *Phyllactinia corylea* do with the second appendages. He proposes a new subgenus *Asterothecia* to which the species belong, characterized by another noteworthy peculiar form of flattened perithecia.

UNCINULA GENICULATA Gerard var. *carpinicola* K. Hara var. nov. in Dainippon Sanrin Kwaihô (Journ. Forestry Assoc. Japan) Tôkyô, no. 392, p. 62, 63, 1 text fig. on p. 64 (to the right) T. 4, vii, Jul. 1915. (Japanese.)

Amphigenous; mycelia persistent or evanescent, thin, filmy; hyphae filamentous, colorless, branching, septate, 3–4 μ across; perithecia gregarious or scattered, spheroid or depressed-spheroid, 70–100 μ diam.; perithecial walls membranaceous, dark-brown, composed of cells 10–18 μ wide; appendages 16–20 altogether, delicate, filiform, straight or infiexed about the middle, continuous, glabrous, equally thickened, spirally helicoid at the apex, 150–440 × 6–7 μ; asci 6–8 in one perithecium, ellipsoid or ovoid, unicellular, hyaline, one or two nucleate at the middle, 15–20 × 9–11 μ.

On *Carpinus* sp.

Locality and distribution: Not given.

Figures (woodcut) give the shape of appendages.

Differs from the type by having (1) amphigenous and much smaller perithecia, (2) very long appendages measuring 1.5 to 4 times as long as the perithecium and in numbers and dimensions of asci and ascospores.

UNCINULA NECATOR (Schw.) Burr. var. *Actinidiae* K. Hara comb. nov. in Dainippon Sanrin Kwaihô (Journ. Forestry Assoc. Japan) Tôkyô, no. 392, p. 63–64, 1 text fig. on p. 64 (middle). T. 4, vii, Jul. 1915. (Japanese.)

U. Actinidiae Miyabe ex Salm. Monogr. Eris. 101. 1900 (nom. nud.).

Spots amphigenous, white or cinereous, irregular, somewhat pulverulent; mycelia thin, effused, persistent or evanescent; hyphae filamentous, branched, septate, 3–4 μ diam.; perithecia amphigenous, scattered or gregarious, spheroid or complanate-spheroid, 80–120 μ, average 100 μ diam.; cells forming perithecial wall 10–20 μ, rarely 23 μ wide, dark-brown; appendages 10–23, linear, simple or rarely forked, 3–7 septate or continuous, colorless above, usually 6–8 μ across, strongly helicoid at the apex, swollen at the base with diam. 9–13 μ, total length 100–250 μ, commonly, 200 μ; asci 4–6, ovoid, ellipsoid or spheroid, beakless or occasionally beaked, 50–60 × 35–40 μ, spherical ones 50 μ diam.; ascospores 4–6, hyaline, ellipsoid or ovoid, 18–23 × 10–13 μ.

On *Actinidia polygama* and *Actinidia Kolomikta*.

Locality and distribution: Not given.

Illustrations (woodcut) gives appendages, ascus, and ascospores. In comparison, several appendages of *U. necator* from wine grape are figured to the left hand.

Note: Salmon states that the occurrence of this fungus on *Actinidia* in Japan suggests that native locality of grape mildew disease in the Orient (Monogr. Erisiph. 1900, p. 101), but Hara considers there is evidently a considerable morphological difference between this and the typical *U. necator,* the former being characterized by short, stout, subrigid appendages, with distinct swollen bases, and by typically beakless asci.

MICROSPHAERA ALNI (Wallr.) Salm. forma Quercus-glandulifera K. Hara forma nov. in Dainippon Sanrin Kwaihô (Journ. Forestry Assoc. Japan) Tôkyô, **392**: 64 Jul. 1015. (Japaneses.)

Appendages once branch dichotomously about the middle. Other characters same as type.

On *Quercus glandulifera.*

Locality and distribution not given.

MACROPHOMA CORCHORI Sawada sp. nov. in Taiwan Nôjihô (Formosan Agric. Review) Taihoku, 120: 868–871. T. 5, xi, Nov. 1916. (Japanese.)

Spots indefinite; mycelia corticolous or lignicolous, occasionally formed in medulla, colorless; hyphae aseptate, branching, 3–8 μ across, freely passing through the host cells; pycnidia subepidermal, punctiform, black, with ostiola erumpent, spheroid, depressed-spheroid or ovoid, often sub-confluent, 98–225 × 89–275 μ; cells forming perithecial wall multiserial, black; ostiola with round openings 15 μ in diam.; conidiophores numerous, densely coarctate, cylindric, somewhat tapering toward the apex, simple, straight or slightly curved, continuous, hyaline, 10–14 × 2.5–3.5 μ, terminated by a single pycnospore; pycnospores ovoid-oblong, oblong-ellipsoid or short-clavate, rounded at the apex, obsuse at the base, straight or slightly curved, smooth, unicellular, finely guttulate, hyaline, 16–32 × 7–10 μ.

On *Corchorus capsularis* (jute).

Locality: Formosa (widely distributed).

Notes: The diseases of jute have not yet been well studied by pathologists even though the plant is so important as a source of textile fiber. Sawada states that this dieback disease is one of the most devastating jute diseases in Formosa and the annual loss is sometimes recorded as 30–40 % of the total crop. The only remedy for this is said to be to avoid an insufficient supply of potash in the soil, and Bordeaux mixture was shown to be no protection against the disease.

Sawada gives (on p. 864) five more species of fungi attacking the jute plant in Formosa, among which two are new, that is, *Phyllosticta Corchori* Sawada sp. nov., *Hymenula nigra* Sawada sp. nov., *Hypochnus centrifugus* (Lév.) Tul., *Sphaeroptheca fuliginea* (Schlecht) Pollacci, and *Rhizoctonia Solani* Kuehn.

PERONOSPORA CHENOPODII-FICIFOLII Sawada sp. nov. in Taiwan, Sôtokufu Nôji Shikenjô (Agr. Exp. Sta. Formosa) Circular. Publication No. 101, p. 9–10, 15, figs. 6–10, June, 1916 (Japanese): in Taiwan Nôjihô (The Formosan Agr. Review) No. 155, p. 29, 32, figs. 6–10. June 20, 1916. (Japanese.)

Hypophyllous, forming a pale-purplish-gray growth on the under surface of leaves, discoloration rather prominent, pale-yellow, round or irregular, about 1–27 mm. in diam., sometimes covering entire under surface; hyphae intercellular, colorless, aseptate, 7–12 μ across haustoria simple or branched at the tips, mostly more or less spiral, 10–20 $\times$ 3–4 μ; conidiospores caespitose from stromata, 240–500 $\times$ 8–14 4μ, 3–6-rarely 7-times dichotomously branching, all branches extremely curved, average of main stem and branches first to fifth orders measuring respectively 310.4 $\times$ 10.5, 33.9 $\times$ 6.5, 27.6 $\times$ 5.9, 24.1 $\times$ 4.5, 16.4 $\times$ 3.8, and 10.2 $\times$ 3.4 μ; conidia oblong or somewhat ellipsoid, papillate at the basal ends, fuliginous or cinereous, 26–36 $\times$ 17–25 (average 30.6 $\times$ 20.9), germinate with germ tubes; germ tubes not conspicuously swollen at the base, 4–7 μ.

Oögonial stage not known.

On *Chenopodium ficifolium*, parasitic, Taiwan (Formosa), common.

PERONOSPORA EFFUSA (Grev.) Ces. var. *minor* Casp.) on *Spinacia oleracea* (spinach: Hôrensô in Japanese) and *Peronospora Chenopodii* Casp. (= *p. effusa* var. *major* Casp.) on *Chenopodium album* are also studied, and inoculation experiments proved the independence of all of these three species. Morphologically, this species differs from *P. effusa* in having (1) spots more intensely colored, (2) hyphae in host tissues thicker with more or less spiral haustoria, (3) curved branches of conidiophore much longer in every respect, (4) papillate conidia more intensely colored, and much longer, (5) germ tubes not conspicuously swollen at the base; from *P. chenopodii* in having (1) more loose and less branching conidiophores, the main stems of which appear more slender, (2) conidia much longer, mostly oblong.

The present idea regarding the omnivorous nature of peronosporaceous fungi will have to be greatly altered, as is proved in this case by inoculation experiments which show an entire lack of relationship among species occurring on closely related host plants, even growing in the same field. Sawada also succeeded in making the following three independent species from what has been known as the lettuce downy mildew fungus, *Bremia Lactucae*, which attacks 66 species belonging to 24 genera so far as has been described.

(1) BREMIA SONCHI K. Sawada sp. nov. in Shokubutsugaku Zasshi (Botan. Magaz.) Tôkyô, **28**[326]: 80–83. Text fig. 2. Feb., 1914. (Japanese.)

Foliicolous or caulicolous; spots small, polygonal, rarely cover entire surface in lower leaves; aërial hyphae usually scanty, arachnoid when appearing on lower leaves; intercellular hyphae hyaline, continuous, finally granulate, 8–17 μ; haustoria spherical, occasionally obovoid or subclavate, 11–24 $\times$ 7–13 μ conidiophores caespitous from stomata, whole length 230–560 μ, upper half 3–6 times dichotomously branching, the dimension of main stem, and branches of first to fourth orders respectively measuring 286 $\times$ 9, 74 $\times$ 8, 65 $\times$ 6, 52 $\times$ 4, 43 $\times$ 3.5 μ, basal portion of main stem somewhat swelling, each branch rather slender, curved, rarely 1-septate throughout the conidiophore, swellings of terminal branches spherical, 2–6 sterigmate, sterigmata 4–7 $\times$ 2.5–3 μ, terminated by single standing conidia; conidia mostly globose, occasionally obovoid, flat-papillate above, small-pedicellate below, containing protoplasm highly reflecting light, 17–24 $\times$ 13–21 μ, germinate in 2 hours; germ tubes 3.5–6 μ diam., varying in thickness through the growth.

On *Sonchus oleraceus*.

Locality: Taiwan (Formosa). Common.

Illustration: One woodcut figure showing conidiophore, haustoria and conidia.

Inoculation result is only positive on above plant, negative on *Crepis japonica, Lactuca debilis, Lactuca laciniata, Lactuca scariola* var. *sativa* (Lettuce), *Arctium Lappa, Hemistepta carthamoides, Sonchus oleraceus,* and *Taraxacum platycarpum*.

Chief morphological difference from *B. Lactucae* lies in (1) the situation of lowest branch of conidiophore nearly at the

middle, not at one-third or one-fifth of the whole length as in *B. Lactucae*, (2) the form of disk of terminal branches of conidiophore nearly spherical instead of disk-shaped.

(2) BREMIA SAUSSUREAE Sawada sp. nov. l. c. p. 80–83. Text fig. 2.

Foliicolous; spots pale-yellowish, polygonal, about 15 mm. broad, forming a dense white growth on the under surface of leaves; intercellular hypae running through mesophyll tissues, granulate, 8–17 μ across; haustoria ovoid, obovoid, or irregular, 14–27 $\times$ 5–14 μ; conidiophore single or caespitose from stomata, very long, 270–1021 μ, 3–6 dichotomously branching, branches all short and stout, the dimension of main stem and branches of first to fourth orders measuring respectively 622 $\times$ 10, 57 $\times$ 8, 37 $\times$ 7, 28 $\times$ 5, 18 $\times$ 4 μ, septate (usually 5–6), swellings of terminal branches 4–6 sterigmate, sterigmata 6–10 $\times$ 3 μ, terminated by single standing conidia; conidia conspicuously large, broadly ellipsoid to elongate-oblong, flat-papillate above, pedicellate below, granulate, 24–57 $\times$ 18–28 μ, hyaline, germinate in 2 hours, germ tubes 4.5–7 μ across, not uniform in diameter.

On *Hemistepta carthamoides* (=*Saussurea affinis* not Spreng.).

Locality: Taiwan (Formosa). Common.

Illustration: One woodcut text figure showing conidiophore, conidia, and haustoria.

Inoculation experiment negative on *Crepis japonica, Sanchus oleraceus, Lactuca debilis, Lactuca scariola* var. *sativa, Lactuca laciniata, Arctium Lappa,* and *Taraxacum platycarpum.*

(3) BREMIA OVATA Sawada sp. nov. l. c. p. 83–84. Text fig. 3.

Hyphae 7 μ across; conidiophores caespitose, total length almost 1 mm., 3–8 times dichotomously branching, usually 7–8 septate, main stem comparatively long, branches short, average dimension of main stem and branches of first to fifth orders measuring respectively 591 $\times$ 8, 55 $\times$ 6, 52 $\times$ 5, 44 $\times$ 3.5, 24 $\times$ 3, 13 $\times$ 3 μ; swelling a terminal branch spherical or top-shaped, 3–7 sterigmate; sterigma 6–8 μ long; conidia ovoid or oblong-ovoid, minutely pedicellate below, apical papilla obsolete, 14–18 $\times$ 10–13 μ, hyaline, granulate, germinate with germ tubes; germ tubes 3.5–4 μ across, nearly uniform in thickness.

On *Crepis japonica,* occurring with *Protomyces Inonyei* P. Henn.

Locality: Taiwan (Formosa). Rare.

Illustration: One woodcut text figure showing conidiophore and conidia.

Sufficient material was not secured to make inoculation experiments. The species is characterized by the very short terminal branch of the conidiophore, the long main stem, ovoid conidia, and uniform growth of germ tubes.

HELICOBASIDIDUM MOMPA N. Tanaka forma *macrosporum* K. Hara form. nov. in Dainippon Sanshi Kwaihô (Journ. Seric. Assoc. Japan) Tôkyô. **26**[308]: 725. T. 6. ix. Sept., 1917. (Japanese.)

Sporidia oblong-ovoid, straight or curved, rounded at the apex, gradually pointing toward the base, 15–25 × 6–8 μ, average 18 × 7 μ.

On *Morus*.

Locality: Not given.

This form is to be distinguished from the typical "Mompa" fungus, which has much smaller sporidia, measuring 10–15 × 5–7 μ. (N. Tanaka, in Journ. Coll. Sci., Tôkyô. **4**[1]: 194. 1891.)

On account of the absence of protobasidia, the species belongs to *Helicobasidium* instead of to *Septobasidium*, to which it was transferred by Raciborski in 1909 (Bull. Int. Ac. Sci. Cracovie; Math.-Nat., Ann. 1909: 365).

BUREAU OF PLANT INDUSTRY,
WASHINGTON, D. C.

A SMUT ON IRESINE

JOHN A. ELLIOTT

Among some specimens of insect-gall material collected by Mr. Chas. C. Dean in Indiana and sent to Dr. B. W. Wells of the

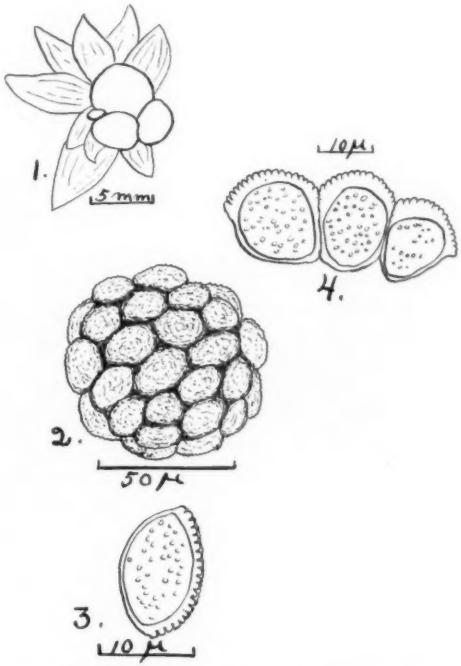

FIG. 1. *Tolyposporium iresine* sori in ovaries of *Iresine paniculata*. FIG. 2. Spore-ball of *T. iresine*. FIG. 3. Single spore of *T. iresine*. FIG. 4. Three united spores of *T. iresine*.

University of Arkansas for identification, was a very interesting smut affecting the ovaries of *Iresine paniculata* (L.) Ktze. In response to an inquiry, Miss Vera K. Charles reported that no

record of a smut on *Iresine* or any of its near relatives could be found in the host index of the Bureau of Plant Industry.

According to Clinton's key in *North American Flora,* the smut belongs in the genus *Tolyposporium,* but no species described by Clinton fits the smut found on *Iresine,* which is therefore described here as new.

As southern Indiana approaches the northern limit of *Iresine paniculata,* it was thought that the smut might be found in Arkansas, where the plant is a very common weed. No specimens of the smut could be found here, however, in the limited search made during the past season, and so far the smut is known only from the place where it was collected by Mr. Dean.

Tolyposporium iresine sp. nov.

Sori in ovaries, infecting all the ovaries of a flower, sparingly scattered throughout the inflorescence, subglobose to globose, 1–5 mm. in diameter, covered with a gray-green, rather tough membrane which on rupturing discloses the granular spore-mass; spore-balls olive-brown, translucent to nearly opaque, subspherical to spherical, firm, composed of from 15–75 spores, 32–70 μ in length, mostly about 60 μ; spores olive-brown, subspherical, lens-shaped, to irregular depending on compression due to surrounding cells, adhering in a hollow ball by folds of their outer thickened, rugose membrane, which may entirely separate from some of the cells on rupturing, 12–20 μ in diameter.

On *Iresine paniculata,* Posey County, Indiana. Collected by Chas. C. Dean, Sept. 21, 1918. Flora of Indiana, No. 26, 651. Known only from the type locality.

UNIVERSITY OF ARKANSAS,
FAYETTEVILLE, ARKANSAS.

NOTES AND BRIEF ARTICLES

Professor J. C. Arthur, one of the editors of MYCOLOGIA and a large contributor both to it and *North American Flora,* was elected President of the Botanical Society of America at the recent meeting in Baltimore.

Mr. James Birch Rorer is now Mycologist of the Associacion de Agricultores del Ecuador, with headquarters at Guayaquil.

Dr. Charles T. Gregory, formerly assistant professor of plant pathology at Cornell University, has entered the Bureau of Plant Industry as extension pathologist in Truck and Forage Crop Diseases for the State of Indiana, with headquarters at Purdue University.

Mr. W. H. Tisdale, formerly scientific assistant in cereal disease investigations, Bureau of Plant Industry, has become the head of the department of botany and plant pathology in the North Carolina College of Agriculture.

Dr. George M. Reed has resigned his position as professor of botany in the University of Missouri to take up work on the smuts of cereals as a pathologist of the Bureau of Plant Industry.

Mr. J. H. Muncie, formerly assistant in plant pathology at the Michigan Agricultural Experiment Station and recently pathologist with the Plant Disease Survey, Bureau of Plant Industry, has accepted the position of pathologist at the new field laboratory of the Pennsylvania Agricultural Experiment Station at Girard, Pennsylvania.

Dr. A. G. Johnson, associate professor of plant pathology at the University of Wisconsin, has accepted an appointment as pathologist in cereal disease investigations, Bureau of Plant Industry.

Dr. V. B. Stewart died of pneumonia on December 3, aged thirty years. He held a research position as assistant professor of plant pathology at Cornell University for five years, during which time he made numerous contributions to his science. The most notable of these concern diseases of horticultural and ornamental nursery stock. On July 1 last he became pathological adviser to the eastern market inspectors of the U. S. Department of Agriculture. This work had to do particularly with detecting incipient disease in shipments of perishable plant products intended for the army and navy. Exposure in the performance of this duty led to the fatal attack.

The Phytopathologists at their recent meeting in Baltimore voted enthusiastically to continue the various kinds of war work begun during the past two years. Dr. C. L. Shear was elected president of the society for the coming year.

A serious gumming disease of old beech trees at Burnham Beeches, supposed to be due to *Bulgaria polymorpha,* was described in the *Annals of Applied Biology* for 1917 by R. J. Tabor and Kate Barratt.

Two new fungi, parasitic on the leaves of Cyclamen, have recently been described by Dr. Trelease in volume 9 of the *Transactions of the Illinois Academy of Science.* One is *Ramularia cyclaminicola* and the other *Phyllosticta cyclaminicola.*

Mr. S. C. Bruner, of the Cuban Experiment Station, has studied a new canker occurring on the trunk and larger branches of *Eucalyptus* and described the causal fungus as *Diaporthe cubensis.* Some species of *Eucalyptus* are found to be entirely immune to this disease.

Among the many interesting specimens collected by Mr. Percy Wilson in Sullivan County, New York, last summer, may be mentioned *Fomitiporella betulina,* on yellow birch; *Elfvingia megaloma,* on rhododendron; and *Funalia stuppea,* on poplar. Sullivan County is within the Local Flora range.

"Peach-Growing," by H. P. Gould, published by the Macmillan Company, contains 25 pages devoted to peach diseases caused by fungi, among them brown-rot, peach-scab, leaf-curl, powdery mildew, rust, crown-gall, root rot, and several other diseases.

In the first number of *Botanical Abstracts,* which appeared last autumn, eight pages are devoted to Plant Pathology under the editorship of Donald Reddick, and a page to the Taxonomy of Non-Vascular Cryptogams, with J. R. Schramm as editor.

This valuable new journal makes an excellent impression and we wish for it the greatest success.

In *Science* for December 27, 1918, Dr. A. H. Graves discusses the results of his investigations in the vicinity of New York City relative to immunity in the chestnut to the canker disease. No immune trees were found, but a number of resistant trees were located, which, according to Dr. Graves, give promise of highly resistant strains through inbreeding and crossing with resistant oriental species.

The very mild autumn weather gave rise to considerable mushroom growth. Mr. W. H. Ballou found near White Plains, on December 21, the following specimen in a growing condition: *Pleurotus ostreatus, Pleurotus serotinus, Hypholoma perplexum, Collybia velutipes, Elfvingia fomentaria, Ganoderma sessile,* and *Phlebia radiata.*

Volume I of the *Memoirs of the Brooklyn Botanic Garden,* issued July 6, 1918, contains papers presented at the dedication of

the laboratory building and plant houses in April, 1917. Of the 33 papers published in this handsome volume of 521 pages and many illustrations, 10 are mycological in character, contributed by Atkinson, Dodge, Jackson, Kunkel, Metcalf, Murrill, Olive, Reed, Shear, and Smith.

The Rose Canker and Its Control is the subject of a *Bulletin of the Massachusetts Agricultural Experiment Station,* published in May, 1918, under the authorship of Dr. P. J. Anderson. This disease, sometimes called the crown-canker of the rose, is comparatively new, having been known as a parasite only two years. The causal fungus is *Cylindrocladium scoparium* Morgan. A full description of the fungus and its effects, as well as various methods of control, are given in the bulletin mentioned.

A recent paper on Some Singapore Boletinae, by Patouillard and C. F. Baker, contains descriptions of 16 new species of Boleti collected during a period of frequent showers in the Singapore Botanical Gardens. These specimens are as follows: *Boletus aureo-mycetinus, B. spinifer, B. tristis, B. phaeocephalus, B. nigricans, B. umbrinellus, B. veluticeps, B. cyanopus, B. viscidulus, B. retisporus, B. pernanus, Boletopsis corrugatus, Boletopsis icterinus, Boletopsis singaporensis, Phylloporus malaccensis,* and *Strobilomyces porphyrius.*

Professor F. S. Earle has been sending a number of specimens of woody and fleshy fungi to the Garden herbarium from Porto Rico, where Mr. Edgar Nelson has now joined him. Regarding the gill-fungi, Professor Earle writes, under date of December 24, "They are certainly very rare in the region of Rio Piedras, being chiefly represented by species of *Marasmius* and *Lepiota.* They are very local and only appear when weather conditions are just right. I do not doubt, however, that the Island will yet afford a long list of them."

Severe parasitic wood-rots of peach trees, due to *Coriolus prolificans* and *C. versicolor,* were observed by Mr. John A.

Elliott, near Lamar, Arkansas, and an account of them published in the December number of *Phytopathology*. The trees had been heavily pruned and also grew on low, heavy soil. The parasitism of the fungi was evident from the fact that the trees had made a vigorous growth for one or two seasons following the cutting back, and had been checked by the destruction, not only of the heartwood of the older parts of the trees, but of the sapwood as well.

The campaign for the control of stem-rust of wheat through the eradication of the common barberry has aroused a widespread and effective sentiment against the shrub. This has resulted in the actual removal of the following estimated percentages of the plants located by a survey conducted by the United States Department of Agriculture: Northern Illinois, 60 per cent.; Wisconsin, 90 per cent.; Minnesota, 80 per cent.; North Dakota, 90 per cent.; South Dakota, 80 per cent.; Nebraska, 75 per cent.; and Iowa, 75 per cent.

Studies in the Mosaic Diseases of Plants by George W. Freiberg, published in the *Annals of the Missouri Botanical Garden* for April, 1917, contains many conclusions, among them the following: (1) Mosaic diseases are not caused by an unbalanced inorganic nutrition. (2) The infectious substance is an enzyme and not a "virus." (3) The reproduction of the mosaic enzyme can be accounted for on purely physiological grounds, but the factors which originally induced its formation are still unknown.

The Laboratory of Forest Pathology of the Bureau of Plant Industry, U. S. D. A., Dr. James R. Weir in charge, has been removed from Missoula, Montana, to Spokane, Washington, where it will be permanently installed in a fire-proof building. The most intensive work of this laboratory is centered in the great white pine forests of Idaho. To promote pathological investigation in this region, a permanent field station will be established; also a forest pathological museum.

All future communications should be addressed to Laboratory of Forest Pathology, Spokane, Washington.

Insect galls are interesting to most mycologists, who will be delighted to know that a large and valuable bulletin on this subject, fully illustrated with many drawings and photographs, has recently been prepared by Dr. E. P. Felt and published as *Bulletin 200 of the New York State Museum.* It is called A Key to American Insect Galls and one wonders how many pages would be required to fully describe the American species of galls if 310 pages have to be devoted simply to a key. It may be said, however, that a good many descriptive terms are employed in the key and that the excellent figures supplement these brief descriptions in a highly satisfactory manner. Dr. Felt is to be congratulated upon the preparation and publication of this much needed work.

On Christmas Day, the following specimens, most of them in a growing condition, were collected in Saxon Woods, near White Plains, and presented to the Garden by Mr. W. H. Ballou.

Daedalea confragosa, D. quercina, Elfvingia megaloma, Hexagona alveolaris, Lenzites betulina, Fomes populinus, Polyporus Polyporus, Bjerkandera adusta, Coriolus nigromarginatus, C. versicolor, C. prolificans, Tyromyces chioneus, Coriolellus sepium, Irpiciporus lacteus, Hydnoporia fuscescens, Poria subacida, Corticium effuscatum, Stereum lobatum, S. complicatum, Merulius tremellosus, Exidia arborea, Auricularia Auricula, Guepinia spathularia, Claudopus nidulans, Panellus stypticus, and *Geaster hygrometricus.*

A paper recently published in the *Journal of Agricultural Research* by Stakman and others on the plasticity of biologic forms of *Puccinia graminis* deals with questions of deep significance and importance. Among the conclusions reached are the following:

No one so-called bridging host nor any combination of such hosts enabled any biologic form tried to infect naturally immune plants nor to infect a highly resistant plant more readily.

Many attempts were made to increase the virulence of biologic forms on resistant hosts by successive transfers to these hosts. The results indicated that rust forms do not gradually adapt themselves to resistant or semicongenial hosts.

Biologic forms seem to be roughly analogous to pure lines. Plus and minus fluctuations may occur, but there is always a tendency to return to normal.

The facts given in this paper do not support the conclusions of previous workers that the pathogenicity of biologic forms is easily changed by host influence.

From the practical standpoint the constancy of biologic forms is of great importance. Breeding for rust resistance can proceed with considerable assurance that the same rust will not adapt itself quickly to new varieties.

GEORGE FRANCIS ATKINSON

Professor Atkinson died in the City Hospital, Tacoma, Washington, on November 14, 1918, from pneumonia following an attack of Spanish influenza. He was recently relieved of active work at Cornell University, where he had been Head of the Department of Botany since 1896, to prepare his extensive notes and photographs of the fleshy fungi for publication. In order to make this work more complete, he was engaged in collecting fungi in regions he had not previously visited, his last explorations being on Mt. Rainier and about Tacoma.

Professor Atkinson has served as a member of the Advisory Board of *North American Flora*, published by the New York Botanical Garden, since the beginning of that work in 1905; and was an associate editor of the *Botanical Gazette*. His publications cover a wide range of subjects, including plant pathology, morphology, taxonomy, embryology, heredity, life-history, etc. He was the author of a number of botanical text-books and numerous contributions to botanical journals, making a total of over 125 titles.

The enthusiasm and energy displayed by Professor Atkinson in personal research and in directing the investigations of others has scarcely been equaled. To his students in all parts of the country,

as well as to his professional associates, his unexpected death comes as a great shock.

W. A. MURRILL

EXTENSION OF WORK IN PLANT PATHOLOGY

Mr. J. A. McClintock has resigned his position as Extension Specialist in Cotton, Truck and Forage Crop Diseases, to which he had been appointed under a joint project between the U. S. Department of Agriculture and the Georgia State College of Agriculture, and will hereafter be located at Experiment. During the coming year it is planned to enlarge the work materially, both along extension and investigational lines. Plans are under consideration which will result in the appointment of two or three additional specialists. Mr. McClintock's successor will be appointed as soon as a suitable man is located. In addition there will be a specialist who will devote his entire time to corn diseases, especially the root rots. A third specialist will have charge of the disease of small grains, the emphasis being directed toward the perfection of control measures for smut and rust.

The Plant Disease Survey of the past season has been wonderfully productive of results. The college now has in hand complete data as to the prevalence and extent of each of the commercially important diseases. During the coming year it is planned to detail a specialist in disease survey to the state for several months to assist in the work.

The laboratory and greenhouse facilities for the use of the Division of Plant Pathology will be considerably augmented and the investigative work will be extended as a result. All research work and extension activities for the state will be carried on directly from the college, under the direction of the Division of Plant Pathology.

J. B. BERRY

ATHENS, GEORGIA.

INDEX TO AMERICAN MYCOLOGICAL LITERATURE

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